Original Article

Preliminary Phytochemical Screening and Heavy Metal Analysis by Atomic Absorption Spectroscopy of a Marketed Polyherbal Churna

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ABSTRACT

Objective: Churna is similar to powder formulations available in allopathic system of medicine. In the present work, a Churna called Surya Shakti Churna was procured from the market. The main objective of the present work is to screen the phytochemical constituents present in the selected Churna and to detect the heavy metals and trace elements in the same.
Method: Chemical test was performed for the screening of phytochemical constituents and atomic absorption spectroscopy was performed for the detection of heavy metals and trace elements.
Result: The Churna contains alkaloids, Glycosides, Terpenoids, Flavonoids, Saponins and the test for other constituents reported negative. The heavy metal content and trace elements present in the Churna was found to be within the limits.
Conclusion: From the results, the churna was standardized and its quality has been ensured for safety and efficacy.

Keywords: Atomic absorption spectroscopy, Churna, heavy metals, Phytochemical screening, Quantitative.

INTRODUCTION

Ayurvedic system of medicine develops enormous formulations of which churna is one of the products. Powder from of drug is mostly preferred and churna being very fine in particle size, they have better absorption and hence good bioavailability[1]. Safety and efficacy of these Ayurvedic preparations are the main parameters to be estimated to ensure the quality of the drug used in the formulation. During the last decade, it has become so vital within the scientific community to standardize the quality of herbal formulations[2].

Trace elements like Sodium, Copper, Zinc, etc., are highly required by the human body to maintain a hale and healthy life[3]. These essential trace elements rather than being supplied from a synthetic source can be given through plant source. They are present in abundance in various plant

sources and these elements are required in at least 100mg daily[4]. There are many herbal churna formulations available in the market for different ailments.

On the other side, heavy metals have been reported to be present in many herbal formulations which are toxic and can cause fatal effects like cancer, hepatic disease, alopecia etc. The main source of these metals to be present in the formulation is due to the environmental pollution like industrial and traffic emission during mud purification, dung containing cadmium, fungicides containing mercury, lead arsenate insecticides[5]. WHO in 1991 has stated that heavy metals like lead, cadmium, mercury, arsenic must be controlled to ensure the safety and efficacy of the Ayurvedic medicines[6].

Churna is a type of formulation in which adulteration can be mostly done. To determine this, there were many attempts made to estimate the toxicity, heavy metals and trace metal quantity present in churna[7]. In this study, an attempt has been taken to screen the phytochemicals and to quantitatively measure the heavy metals and trace elements in the churna by atomic absorption spectroscopy.

MATERIALS AND METHODS

Surya Sakthi Churna was procured from Vali nivarani maiyam, Chennai. It was evaluated for the phytoconstituents and the quantity of heavy metals and trace elements present in the formulation. The heavy metal analysis was carried out by using atomic absorption spectroscopy.

Phytochemical screening

The churna was analyzed for the phytoconstituents present in the formulation. Test for alkaloids, flavonoids, carbohydrates, tannins, saponins, glycosides, phenolic content were performed[8,9].

Test for alkaloids

- A few drops of acetic acid were added to the test substance. Dragendorff's reagent was added to the above mixture and shaken well. Formation of an orange red precipitate indicates the presence of alkaloids.
- The sample was added to dilute Hydrochloric acid and Mayers reagent. White precipitate indicates presence of alkaloids.

Test for glycosides

- Churna was added with little amount of anthrone and one drop of concentrated sulphuric acid was added and made into a paste, gently warmed on a water bath. The appearance of dark green color indicates the presence of glycosides.

Test for terpenoids: Noller's test

- Churna was warmed with tin and thionyl chloride. Appearance of pink colour indicates presence of terpenes.

Test for flavonoids: Shinoda's test

- To the churna in alcohol a few magnesium turnings and concentrated Hydrochloric acid were added and boiled. Red coloration indicates presence of flavonoids.

Test for steroids: Liebermann–Burchard test

- Churna was dissolved in chloroform and added with 3ml of acetic anhydride; 3ml of glacial acetic acid were warmed and cooled. To this a few drops of concentrated sulfuric acid were added along the sides of the tube. Presence of steroids is indicated by bluish green color.

Test for carbohydrates

- Churna was warmed with Fehling's solution A and B. Red color indicates the presence of carbohydrates.

Test for phenols

- A few drops of alcohol and ferric chloride solution were added to churna. Bluish green /red color indicates presence of phenols.

Test for tannins

- Churna was mixed with lead acetate solution forms a white precipitate indicates the presence of tannins.

Test for saponins

- Churna when vigorously shaken with water forms copious lather indicating presence of saponins.

Heavy metal analysis by atomic absorption spectroscopy

Atomic Absorption Spectrophotometer was used for the determination of heavy metals in the churna[10-16].

2g of churna was digested by using 10ml of nitric acid and was heated on a hot plate at 95°C. This was then cooled and added with 5ml of concentrated nitric acid and heated again. It was cool and then 2ml of deionised water and 3ml of 30% hydrogen peroxide was added and heated. It was removed from the heat when effervescence appears and added with hydrogen peroxide until effervescence ceases. 5ml of concentrated hydrochloric acid and 10ml of deionised water was added and heated. Then it was filtered using Whatman filter paper. Thus digested sample was analyzed for heavy metals like lead, cadmium, arsenic, mercury and trace elements like copper, zinc, potassium, selenium, iron by Atomic Absorption Spectroscopy.

RESULTS AND DISCUSSION

The phytochemical analysis of the churna was performed and the results have been tabulated in Table 1.

The sample was analyzed for all the above mentioned heavy metals and trace elements and the results were found to be within the permissible limits. Thus this churna has been quantitatively estimated for its safety related to the heavy metal content (Table 2.) and trace elements which can help in maintaining good health of the human body. (Table 3.)

CONCLUSION

The present study emphasizes that the government has to implement proper and strict rules and guidelines to be followed in the formulation of Ayurvedic preparation to determine the safety profile of the formulation and there is an immediate need in quality control of Churna. The toxic content of heavy metal can be fatal, so they should be at a minimal level in the body.

Thus the present study helps in quantitative determination of heavy metals and trace element concentration in herbal formulations.

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Table 1. Phytochemical analysis of the churna

S. No.	Phytoconstituents	Observation
1.	Alkaloids	+
2.	Glycosides	+
3.	Terpenoids	+
4.	Flavonoids	+
5.	Steroids	-
6.	Carbohydrates	-
7.	Phenols	-
8.	Tannins	-
9.	Saponins	+

+ Indicates presence and – indicates absence

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Table 2. Heavy metal content in the churna

S. No.	Heavy metal	Concentration in ppm
1.	Lead	8.45
2.	Cadmium	0.45
3.	Arsenic	0.91
4.	Mercury	1.24

Table 3. Trace element concentration in the churna

S. No.	Trace element	Concentration
1.	Sodium	45.4mg
2.	Copper	0.32ppm
3.	Zinc	4.56mg
4.	Potassium	22.3mg
5.	Selenium	1.24mcg
6.	Iron	3.09mg